

Impact of Preoperative Patient Characteristics on Posturethroplasty Recurrence: The Significance of Stricture Length and Prior Treatments

Jibril Oyekunle Bello

Department of Surgery, University of Ilorin Teaching Hospital, Ilorin, Nigeria

ABSTRACT

Introduction: Urethral strictures are common in urologic practice of Sub-Saharan Africa including Nigeria. We determine the rate of stricture recurrence following urethroplasty for anterior urethral strictures and evaluate preoperative variables that predict of stricture recurrence in our practice. **Subjects and Methods:** Thirty-six men who had urethroplasty for proven anterior urethral stricture disease between February 2012 and January 2015 were retrospectively analyzed. Preoperative factors including age, socioeconomic factors, comorbidities, etiology of strictures, stricture location, stricture length, periurethral spongiofibrosis, and prior stricture treatments were assessed for independent predictors of stricture recurrence. **Results:** The median age was 49.5 years (range 21–90), median stricture length was 4 cm (range 1–18 cm) and the overall recurrence rate was 27.8%. Postinfectious strictures, pan urethral strictures or multiple strictures involving the penile and bulbar urethra were more common. Most patients had penile circular fasciocutaneous flap urethroplasty. Following univariate analysis of potential preoperative predictors of stricture recurrence, stricture length, and prior treatments with dilations or urethrotomies were found to be significantly associated with stricture recurrence. On multivariate analysis, they both remained statistically significant. Patients who had prior treatments had greater odds of having a recurrent stricture (odds ratio 18, 95% confidence interval [CI] 1.4–224.3). Stricture length was dichotomized based on receiver operating characteristic (ROC) analysis, and strictures of length ≥ 5 cm had significantly greater recurrence (area under ROC the curve of 0.825, 95% CI 0.690–0.960, $P = 0.032$). **Conclusion:** Patients who had prior dilations or urethrotomies and those with long strictures particularly strictures ≥ 5 cm have significantly greater odds of developing a recurrence following urethroplasty in Nigerian urology practice.

KEYWORDS: Penis, recurrence, urethra, urethral stricture, urethroplasty

Address for correspondence:

Dr. Jibril Oyekunle Bello,
Department of Surgery, University of Ilorin Teaching Hospital,
Ilorin, Nigeria.
E-mail: jabarn@gmail.com

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to the disease's burden.^[1] In addition, iatrogenic strictures from inappropriate urethral catheterizations and urethral instrumentations are increasingly seen.^[2] As a result, strictures seen in the region are often long and complex thus requiring definitive urethroplasty.

Open urethroplasty is the gold standard for definitive treatment of urethral stricture with dilations and urethrotomy often reserved for short segment incomplete and soft strictures.^[3,4] It is also abundantly clear that urethroplasty offers the better outcomes in terms of lower recurrence rates when compared to dilations and urethrotomies.^[3,4] Repeated dilations or urethrotomies may result in greater scarring of the urethra and longer strictures and subsequently more difficult definitive repairs with lower success rate.^[5] Urethroplasty is now advised in event of failure after a single attempt at dilations or urethrotomy for selected strictures as repeated attempts are of no use.^[5]

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INTRODUCTION

The true world incidence of urethral strictures is unknown. In Sub-Saharan Africa however, the incidence is probably higher as strictures resulting from postinfectious etiologies particularly postgonococcal urethritis remains an important contributor

Outcomes of treatment of urethral strictures are better following prompt referral for care to reconstructive urologists other than subjecting patients to repeated ineffective procedures and resultant complications. Although Nigeria has suboptimal numbers of urologists for the growing population many of these are performing urethroplasties.^[6,7] There is increasing evidence of a decline in the use of dilatations and urethrotomies in the management of strictures by urologists in the region and an uptake in urethroplasty volume especially in tertiary and university hospitals.^[8-12]

Optimizing the outcomes of urethroplasty is important because the procedure offers the best opportunity at cure of a debilitating condition; we thus reviewed urethroplasties for anterior urethral strictures done at a tertiary care university hospital in North-Central Nigeria to determine recurrence rate and the preoperative factors that independently predict recurrence.

SUBJECTS AND METHODS

The records of men who had urethroplasty done for proven urethral stricture disease between February 2012 and January 2015 by single surgeon in North-Central Nigeria, Sub-Saharan Africa were retrospectively analyzed. Only patients whose urethroplasty were for anterior urethral stricture and have completed at least 6 months of follow-up were included in subsequent analysis. Revision urethroplasties were excluded. Data retrieved included age, socioeconomic status, comorbidities, prior stricture treatments, stricture length, stricture location, stricture etiology, and periurethral spongiofibrosis (assessed using the clinical surrogate of palpable urethral induration).

Urethral patency status was determined at last follow-up. Stricture recurrence was defined as any one of the following:

- Recurrent urinary symptoms and or poor uroflowmetry <15 ml/s with imaging showing the reoccurrence of the stricture
- The requirement for additional intervention during follow-up after the primary urethroplasty which may include dilatations, urethrotomies, or redo-urethroplasty.

Data analysis was carried out with STATA 14.0 software (StataCorp, College Station, Texas, USA). Univariate and multivariate logistic regression of potential predictive variables of recurrence was carried out to determine independent predictors of stricture recurrence. Receiver operating characteristic (ROC) curves was used to identify cut-offs values for the predictive continuous variable, $P \leq 0.05$ was considered significant.

RESULTS

Complete data were available for 36 men who had urethroplasty during the study period for anterior urethral stricture disease. The median age was 49.5 years (range 21–90 years), median stricture length was 4 cm (range 1–18 cm), median follow-up

posturethroplasty was 6 months (range 6–30 months), and the overall recurrence rate was 27.8%. Table 1 lists the preoperative characteristics of the study population by stricture recurrence status. Postinfectious strictures (18, 50.0%) were more common. Half of the patients studied had pan urethral strictures or multiple strictures involving the penile and bulbar urethra. Recurrence was highest (40%) following urethroplasty for the multiple and pan urethral strictures [Table 1]. Most patients had penile circular fasciocutaneous flap urethroplasty (13, 36.1%) followed by anastomotic urethroplasty (11, 30.6%). The remaining patients had buccal mucosal graft (5, 13.9%), Orandi penile skin flap (5, 13.9%), and other techniques such as composite flap and graft (2, 5.5%). Stricture recurrence was the most common following penile circular fasciocutaneous flap urethroplasty (61.5%).

Following univariate analysis of potential preoperative predictors of stricture recurrence [Table 2], stricture length and prior treatments with dilatations or urethrotomies were found to be significantly associated with stricture recurrence. On multivariate analysis [Table 2], both stricture length and prior treatments with dilatations or urethrotomies remained statistically significantly associated with an increased risk of recurrence. However patients who had prior treatments with dilatations or urethrotomies had greater odds of having a recurrent stricture (odds ratio 18, 95% confidence interval

Table 1: Preoperative characteristics of patients by stricture recurrence status

Variables	Overall	No	Yes	P
Number of patients (%)	36	26 (72)	10 (28)	
Median age (range)	49.5 (21-90)	49.5 (21-80)	47.5 (25-90)	0.96
Median stricture length (range)	4 (1-18)	3 (1-18)	8 (4-16)	0.01
Stricture location				
Penile	5 (14)	4 (15)	1 (10)	0.10
Bulbar	13 (36)	12 (46)	1 (10)	
Penile and bulbar	11 (31)	7 (27)	4 (40)	
Pan urethral	7 (19)	3 (12)	4 (40)	
Spongiofibrosis, n (%)				
Mild	18 (50)	12 (46)	6 (60)	0.46
Severe	18 (50)	14 (54)	4 (40)	
Stricture etiology, n (%)				
External trauma	2 (6)	2 (8)	0 (0)	0.33
Inflammatory	2 (6)	2 (8)	0 (0)	
Instrumentation	14 (38)	8 (30)	6 (60)	
Infection	18 (50)	14 (54)	4 (40)	
Socioeconomic status, n (%)				
High	1 (3)	1 (4)	0 (0)	0.53
Middle	13 (36)	10 (38)	3 (30)	
Low	22 (61)	15 (58)	7 (70)	
Co morbidity, n (%)				
Hypertensive	10 (28)	6 (23)	4 (40)	0.31
Diabetic	3 (8)	2 (8)	1 (10)	0.82
Prior treatments*, n (%)	5 (14)	1 (4)	4 (40)	0.001

*Dilatations and urethrotomies

Table 2: Univariate and multivariate logistic regression models for recurrence of stricture following urethroplasty

Variables	Univariate			Multivariate		
	OR	95% CI	P	OR	95% CI	P
Mean age	0.99	0.96-1.04	0.96			
Stricture length*	1.20	1.03-1.39	0.02	1.20	1.02-1.42	0.03
Stricture location						
Penile	Reference	Reference	Reference			
Bulbar	0.33	0.02-6.65	0.47			
Penile and bulbar	2.29	0.19-28.19	0.52			
Pan urethral	5.33	0.38-75.78	0.22			
Postinfection	Stricture	0.57	0.13-2.51	0.46		
Severe spongiofibrosis	0.56	0.12-2.51	0.45			
Low socioeconomic status	2.57	0.44-14.82	0.29			
Prior treatments*	16.67	1.57-177.5	0.02	17.85	1.42-224.25	0.03
Hypertension	0.45	0.10-2.14	0.32			
Diabetes	1.33	0.11-16.60	0.82			

*Significant at univariate analysis and carried onward to multivariate analysis. CI: Confidence interval, OR: Odds ratio

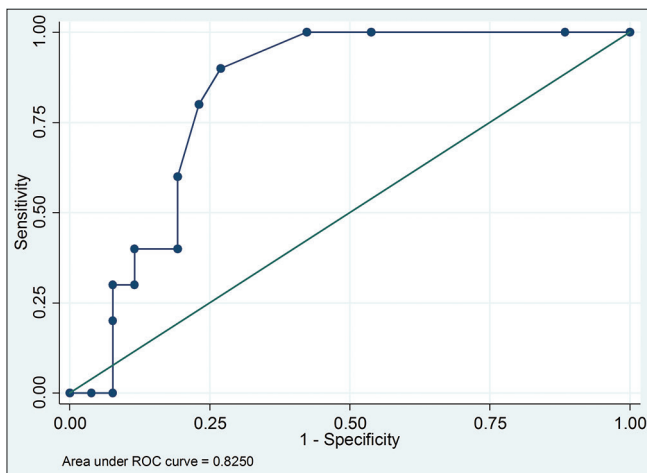


Figure 1: Receiver operating characteristic curve for stricture length predicting recurrence. A cut-point of 5 cm has simultaneous high sensitivity and high specificity for predicting recurrence. Area under receiver operating characteristic the curve = 0.825

[CI] 1.4–224.3). Stricture length was dichotomized based on ROC analysis and strictures of length ≥ 5 cm had significantly greater recurrence (area under ROC the curve of 0.825, 95% CI 0.690–0.960, $P = 0.032$) [Figure 1].

DISCUSSION

Studies on stricture recurrence following urethroplasty are relatively sparse and at present not much is known about outcomes in Sub-Saharan African urologic practice. This study assesses preoperative predictors of recurrence following urethroplasty at a urology center in Nigeria. We found that half of our studied patients had postinfection urethral strictures and the majority also had complex long or multiple strictures. This was not surprising as it has been suggested that the incidence of urethral strictures is probably higher in the Sub-Saharan Africa region due to the significant burden still posed by sexually transmitted infections particularly gonococcal urethritis.^[1] We

reported an overall recurrence rate of 27.8% which is higher than the overall stricture recurrence rate of 15.6% reported by Meeks *et al.* in a systemic review of 302 articles which included 5617 urethroplasties.^[3] The differing recurrence rates found may be due to the difference in volumes and or expertise. The difference may also be the consequence of a higher incidence of postinfectious strictures and thus predominantly more complex strictures seen in our region.

We found that only stricture length and prior treatments of strictures with urethral dilatation and urethrotomies were the factors associated with significantly greater odds of recurrence following urethroplasty. In the current study, prior treatments with dilatations or urethrotomies had the greater impact on stricture recurrence with 18 fold increased odds of recurrence when compared to those without prior treatment. This is probably because the inappropriate use of dilatations or urethrotomies could result in additional injuries to the urethra resulting in greater scarring, longer strictures, and more difficult repairs.^[5] It is clear from literature that repeated dilatation or urethrotomies after prior failed attempts is palliative with expected recurrence.^[4] Urethroplasty is now advised in the event of failure after a single attempt at dilatations or urethrotomy for selected strictures as repeated attempts are of no use.^[5] We also found that increasing length of strictures was associated with a significant increased odds of recurrence and strictures ≥ 5 cm had higher recurrence than those < 5 cm. Meeks *et al.* also noted that recurrence was significantly higher for strictures longer than 5 cm (16.6%) compared to those < 5 cm (12.4%).^[3] A study which reviewed over 600 urethroplasties also found that strictures ≥ 5 cm had an increased recurrence rate of 14% compared to 6% for strictures ≤ 5 cm.^[13] Interestingly, all three studies found that 5 cm represented a critical threshold above which recurrence rate of urethroplasty increased significantly. This stricture length landmark may reflect the point above which stricture complexity is increased such that risk of recurrence after urethroplasty is higher and plausibly stricture length of 5 cm may represent a valid threshold for a new classification into simple and complex urethral strictures.

In this study, we assessed only the predictive value of preoperative factors and excluded operative techniques in the analysis as the technique employed depended significantly on a mix of preoperative factors of length, stricture site and etiology. In addition, some techniques are not applicable for certain types of strictures. In our practice, anastomotic technique was used mainly for short segment bulbar strictures of traumatic origins, Orandi penile skin flap urethroplasty for distal penile strictures and penile fasciocutaneous flaps or buccal mucosa grafts for longer penile and bulbar strictures. Composite flap plus graft which combined penile fasciocutaneous flap and buccal mucosa graft was used for two patients with very long strictures >12 cm in this study.

To our knowledge, this study is the first to comprehensively evaluate preoperative predictors of recurrence following urethroplasty in Nigerian urological practice. We demonstrate that patients who had prior dilatations/urethrotomies or long strictures had significantly greater odds of recurrence following urethroplasty. These men would probably benefit from prompt referral to centers with reconstructive urologists for specialist care rather than subjecting them to further ineffective care and possibly more difficult delayed repair. Santucci had proposed referral of complex and difficult stricture cases to someone who has logged thousands of hours at urethroplasty for expert care.^[14]

We recognize certain limitation in this study. It is a retrospective study based at a single institution and may not represent national urethral stricture patient population or practice patterns. Nevertheless, we achieved our goal of providing an analysis of the effect of preoperative factors on outcomes following urethroplasty. A multi-institutional and prospective study would be of value in confirming our findings.

CONCLUSION

This study found an overall stricture recurrence rate of 27.8%. Patients who had prior dilatations or urethrotomies and those with long strictures particularly strictures ≥ 5 cm have significantly greater odds of developing a posturethroplasty recurrence in Nigerian urology practice.

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Conflicts of interest

There are no conflicts of interest.

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